



Original Communication

Landmine associated injuries in children in Turkey

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ARTICLE INFO

Article history:

Received 2 April 2009

Accepted 1 July 2009

Available online 27 August 2009

Keywords:

Landmine injury

Children

Forensic case

ABSTRACT

This study aims to examine trends of injuries due to landmines and unexploded ordnance (UXO) and to determine problems during and after the treatment of children and adolescent victims in Turkey. Data from the records of 23 children injured from landmines and UXO were analyzed from April 2001 to October 2008. Cases consist of 21 (91.3%) males and two (8.7%) females with a mean age of 12.8 years. Cause of injury was landmine explosion in 20 (87.0%) and UXO in three (13.0%) cases. Injuries in upper and lower extremities were determined in eight (34.8%) children. Hand amputation was the result in 10 (43.5%) children where in two cases a leg, in one case an eye, in one case a hand and arm, in two cases a hand and leg, in one case an eye and a leg and in three cases a hand and eye were lost. One case of death was recorded from UXO with an autopsy performed. Contaminated areas in our region should be cleared according to international contracts to prevent injuries in children, centers providing rehabilitation services should be established and policies regarding social support for child victims should be ascertained.

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1. Introduction

Although prohibited by international legislations, the landmine monitor now estimates that 54 countries have stockpiles; totaling 176 million antipersonnel mines and every year an estimated of 15,000 people die or get injured.^{1,2}

The majority of the landmines in Turkey were laid between 1956 and 1959 at the border regions of Bulgaria, Greece, Azerbaijan, Armenia, Iran, Iraq and Syria to prevent illegal border crossings. In addition, landmines were used by government forces as part of anti-terror interventions in the southeast and east of Turkey between 1984 and 1999. Landmines have been reported to be placed in the same regions by illegal organizations during and after this period. Turkey reported in 2008 that a total of 982,777 mines remained emplaced on its territory. In the year 2007, 28 deaths and 73 injuries related to landmines and UXO were reported.³

Besides, a total of 55 children died and 169 were injured in association with landmines and unexploded ordnance (UXO) between 2002 and 2007.⁴

Injuries from landmines and UXO remain a public health concern in Turkey. The only physical rehabilitation service that is available in the region is the Orthopedics and Traumatology Center (OTC) and the Prosthetic Center of the Dicle University Research Hospital in Diyarbakir but its services are insufficient.

In this study, we aimed to determine problems that children from this region face after landmine and UXO injuries and related treatments and to examine and to determine problems during and after the treatment of children and adolescent victims and to develop suggestions for injury prevention in children.

2. Material and methods

This study was conducted at the Research and Education Hospital of the University of Yuzuncu Yil in the city of Van, the capital of the ancient Urartu civilization, which is located near to Iran, Iraq

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and Armenia. The hospital is a tertiary care referral centre, located in the east of Turkey.

Data from the records of 23 children with injuries from landmines and UXO admitted to our hospital were analyzed retrospectively. History, age, sex, type of injury, location of incident, life-threatening criteria, crime scene, organ losses and posttraumatic and post-treatment social circumstances of the patients were evaluated. Victims were contacted using the reported address and were interviewed regarding current condition of disability and social support. Statistical analyses were performed using SPSS software version 16.0. Informed consent from the victims and ethical approval from the Ethical Committee on Publishing of the University was obtained.

3. Results

Data included information on 23 children injured by landmines or UXO between April 2001 and October 2008. Cases consist of 21 (91.3%) males and two (8.7%) females with a mean age of 12.8 years. Four (17.4%) were 7–9 years, 10 (43.5%) were 7–12 years, 12 (52.1%) were 10–15 years, 11 (47.8%) were 13–18 years old. Cause of injury was landmine explosion in 20 (87.0%) and UXO in three (13.0%) cases. Eleven (47.9%) patients were admitted from health facilities near to the Iraq border, nine (39.1%) from the Iran border and three (13.0%) from Bitlis (near city to Van). Cause of injury was explosion of landmines in 20 (87.0%) and UXO in three (13.0%) cases. Injuries in upper and lower extremities were determined in eight (34.8%) children, only upper extremity in six (26.1%) and upper extremity and head injuries were detected in three (13.0%) children. Life-threatening injuries were present in 22 (95.7%) children. Hand amputation was the result in 10 (43.5%) children where in two cases a leg, in one case an eye, in one case a hand and arm, in two cases a hand and leg, in one case an eye and a leg and in three cases a hand and eye were lost. One case of death was recorded from UXO with an autopsy performed. No organ loss was seen in two cases (Table 1).

External examination revealed multiple lesions of 0.5–3.0 cm diameters caused by shrapnel in one case with head injuries and in six cases with head and body injuries (Fig. 1). A lesion of 2 × 2 cm diameter in the midfrontal area at the hairline with an irregular border and burns of second degree and a wound tracing to the skull with a bony defect were determined at the autopsy of the deceased case (Fig. 2). The victim had several shrapnel wounds changing from 0.1 × 0.1 cm to 3.0 × 4.0 cm diameter on the face, sternum, right abdomen, hands and forearms, feet and anterior cruris, medial thighs and genitalia. Multiple shrapnel wounds of 1.0 × 3.0 cm size were detected in two cases injured with landmine and UXO (Fig. 3). Shrapnel wounds of different sizes were determined in eight cases showing injuries on the upper and lower extremities (Fig. 4). Traumatic amputation of the leg in eight cases and arm amputation in one case were recorded (Fig. 5). Fig. 6 shows some pieces of the explosives obtained from the cases during external examination, extremity amputations and autopsy. Mines often are laid around objects of economic importance (e.g., military zones, field of fire, border), resulting in injuries among persons who are traveling or performing activities of economic necessity (e.g., farming, collecting wood or water or scrap, and tending animals). UXO often lie on the surface of the ground and thus are more visible and easier to avoid. However, because of their visibility, UXO pose a particular threat to children and adolescents who like to play with strange objects. Fig. 7 shows some drawings made by the victims with the aim to classify the UXO. Eye involvements in these cases were in the form of ocular trauma with multiple foreign bodies on the eyelid, conjunctiva, cornea and sclera due to landmine explosions. Ocular trauma was bilateral in three cases. Evisceration was performed

Table 1

Age, sex, type of explosives, activity during injury, injury type and type of amputations.

	7–12 years (%)	13–18 years (%)	Total (%)
Sex			
Male	10(43.5)	11(47.8)	21(91.3)
Female	1(4.3)	1(4.3)	2(8.7)
Total	11(47.9)	12(52.1)	23(100.0)
Type of explosives			
Landmines	11(47.8)	9(39.1)	20(87.0)
UXO	2(8.7)	1(4.3)	3(13.0)
Total	13(56.5)	10(43.5)	23(100.0)
Region of event			
Iran border–Van	7(30.4)	2(8.7)	9(39.1)
Iraq border–Hakkari	6(26.1)	5(21.7)	11(47.8)
Bitlis border–Van and Hakkari	1(4.3)	2(8.7)	3(13.0)
Total	14(60.9)	9(39.1)	23(100.0)
Activity during injury			
Collecting wood, food, water	2(8.7)	2(8.7)	4(17.4)
Farming	2(8.7)	2(8.7)	4(17.4)
Tending animals	2(8.7)	1(4.3)	3(13.0)
Playing/recreation	3(13.1)	2(8.7)	5(21.7)
Tampering with explosives	2(8.7)	1(4.3)	3(13.0)
Passing, standing nearby	1(4.3)	1(4.3)	2(8.7)
Other, unknown	1(4.3)	1(4.3)	2(8.7)
Total	13(56.5)	10(43.5)	23(100.0)
Injury type			
Death	–	1(4.3)	1(4.3)
Upper body injury	4(17.4)	2(8.7)	6(26.1)
Lower body injury	1(4.3)	1(4.3)	2(8.7)
Upper and lower body injury	6(26.1)	2(8.7)	8(34.8)
Upper body injury and skull	2(8.7)	1(4.3)	3(13.0)
Chest, abdomen and other	2(8.7)	1(4.3)	3(13.0)
Total	15(65.2)	8(34.8)	23(100.0)
Type of amputations and loss of organ			
Upper limb	6(26.1)	4(17.4)	10(43.5)
Lower limb	1(4.3)	1(4.3)	2(8.7)
Upper and lower limb	3(13.0)	1(4.3)	4(17.4)
Eye	1(4.3)	–	1(4.3)
Lower limb and eye	–	1(4.3)	1(4.3)
Upper limb and eye	2(8.7)	1(4.3)	3(13.0)
No loss of organ	1(4.3)	1(4.3)	2(8.7)
Total	14(60.9)	9(39.1)	23(100.0)

UXO = unexploded ordnance.



Fig. 1. Injury in the face due to landmine blast.

in two cases. Primary repair and foreign body excision was performed in five cases with corneascleral perforation. Vitrectomy was performed in one of these five cases with intravitreal foreign



Fig. 2. Injury in the frontal region due to UXO causing death.



Fig. 5. Amputation of right upper limb due to landmine blast.



Fig. 3. Injury of lower limb and abdomen due to landmine blast.



Fig. 6. UXO pieces postoperatively.



Fig. 4. Amputation of right lower limb due to landmine blast.

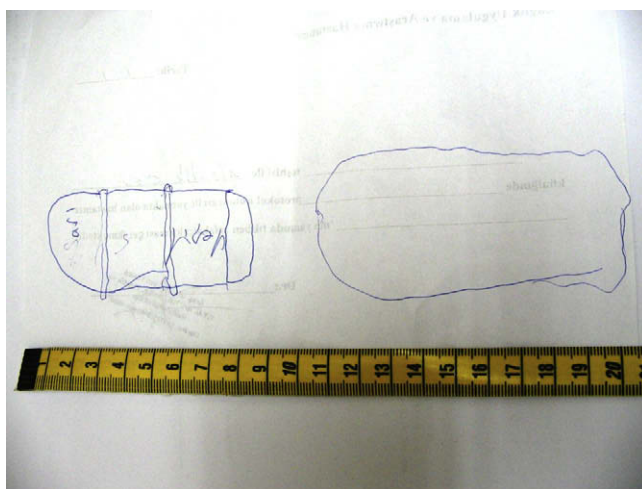


Fig. 7. Drawings of children about UXO.

body. Four eyes had no light perception, in one eye 0.1, one eye could count fingers and one eye was at level 0.4. One eye had no reduction in the ability to see.

Thirteen (56.5%) victims were contacted to obtain information about their outcomes. Six (26.1%) victims had left school, two suspended school and five were continuing school. Of the victims, two

Table 2

Post-treatment educational and rehabilitation status of victims.

Victims (n = 13)	Education	Rehabilitation	Prosthesis
1	Left school	None	Leg prosthesis missing
2	Suspended 2 years	Continuing	Leg prosthesis existing
3	Continuing	Some	Hand-arm prosthesis existing
4	Left school	None	Hand prosthesis missing
5	Continuing	None	Hand-arm prosthesis missing
6	Suspended 1 year	Continuing	Hand-arm prosthesis existing
7	Continuing	None	Eye prosthesis existing
8	Left school	None	Eye prosthesis missing
9	Left school	Some	Hand-arm prosthesis existing
10	Continuing	None	No organ loss
11	Continuing	None	Hand prosthesis missing
12	Left school	None	Hand prosthesis missing
13	Left school	Some	Eye and hand prosthesis missing

were admitting a rehab program, three had participated a program previously and eight had never took part. Two cases possessed arm prosthesis; another one a leg, one hand and eye and one eye prosthesis (Table 2).

4. Discussion

No comprehensive data exists about landmine victims in the world and people are affected by landmine injuries in 84 countries. It is estimated that 15,000 cases of injuries per year are associated with landmine explosions.⁵ Only records of patients with injuries admitted to the hospitals are reliable. Therefore, studies inform about the difficulty in obtaining the exact numbers of victims.⁵ The majority of deaths associated with landmine explosions occur at the accident site or on the way to the hospital.⁶ A study from Mozambique reports that 75% of death cases associated with landmines occur before reaching the hospital.⁷ Hospital records of injuries associated with landmines and personal interviews with the victims after treatment were used to construct this study. A mine blast causes extensive injuries and psychological trauma because of special designs. Treatment is needed urgently as is the transports to the hospital to increase survive rates of the victims.^{8,9} Loss of blood can be enormous needing transfusions in the early period. Timely use of antibiotics is critical to prevent gangrenous infections.¹⁰ Nearly one third of mine victims who reach the hospital lose at least one limb after a landmine blast.¹¹ Local debridement of necrotic tissue and extraction of foreign bodies are very important during surgery.^{10,12}

Injury led to amputation of the hand in 13 (56.5%), the leg in three, hand and leg in two, hand and forearm in one and loss of the eye in five cases. Handling of the mine was the dominant cause of organ loss including hands and eyes in children.

Hospital stays are longer in landmine victims compared to gunshot injuries.¹³ A mine blast causes extensive injuries and psychological trauma. Access to rehabilitation for persons with disabilities should be assured, physiotherapy and rehabilitation centers should have easy access with support in providing artificial limbs and wheelchairs and psychological support should be available for survivors. Resources to improve employment prospects of persons with disabilities must be increased.^{5,9,14} Amputation was performed in 19 (82.6%) cases in our study. This high percentage of amputations in children suggests that UXO in rural areas compose an enormous risk for children.

According to the World Health Organization (WHO) only 5% of survivors are able to obtain support from rehabilitation services which in turn are mainly located in big cities.¹⁴ Physical rehabilitation services, including prosthetics (below-knee only) for survivors, are not available in our region. The nearest facilities are the Orthopedics and Traumatology Center (OTC) and the Prosthetic

Center of the Dicle University Research Hospital in Diyarbakir and the Gulhane Military Medical Academy and the Turkish Armed Forces Rehabilitation and Care Centre (TAF-RCC) in Ankara which are 377 km and 1234 km away from Van, respectively. Therefore, a physical rehabilitation center with prosthetic and psychological support units should be established in this region of Van and Hakkari located at the Iran and Iraq borders. We were able to contact 13 (56.5%) victims and obtain information about their situations. In the passing years, six victims possess prosthesis, two were admitting a rehab program, four had discontinued school, five were attending a school, and one was acquiring psychological support. Information about the remaining victims was unavailable due to insufficient hospital records. Long-term disability or psychological impact on victims and their families are not monitored. Many disabled victims lose opportunities to participate daily life due to inadequate settings in surroundings and schools, and educational activities come to an end with the accident.

Landmines also hamper agriculture and livestock in a country. Herding animals carries a great risk for the inhabitants. It is reported that agricultural products could be increased for 88–200% after clearance of the contaminated areas.¹⁵ Three of our cases were injured during herding animals. Contaminated meadows and fields at the borders should be determined and programs should prioritize clearance of these dangerous areas. In December 1997, The Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction was signed by a total of 122 governments in Ottawa, Canada. As of March 2008, there are 156 member states and 39 states that remain outside the treaty globally.¹⁶ The States Parties to the treaty are obliged to destroy their stockpiled mines within 4 years and to clear their mine-affected areas within 10 years. The Republic of Turkey acceded to the Mine Ban Treaty on 25 September 2003, becoming a State Party on 1 March 2004.¹⁷ Bilukha et al. reported that 47.2% of 5471 individuals injured or killed by landmines or UXO were among children younger than 18 years in Afghanistan and 17% of those injured died as a result of the blast.¹⁸

Children were more likely to experience upper limb amputation (24.3%) compared with adults (14.8%), whereas upper extremity injuries were very high (78%) in our region.

Children were more likely to be injured by UXO and to sustain upper body injury and upper limb amputations compared with adults. Most injuries that occurred while the person was traveling or performing activities of economic necessity (farming; tending animals; collecting wood, food, or water) were caused by landmines, while most injuries that occurred while the person was playing near an explosive device or tampering with it were caused by UXO.

Children are especially exposed to risks of landmines and UXO because of curiosity in small and colored, toy-like shapes of these explosives.^{2,18} We observed that some children described and performed drawings of explosives as if they were toys.

In a study from Afghanistan describing landmine related injuries in the years 1997–2002, half of the injuries due to UXO were in children aged fewer than 18 years. In a total of 6114 blasts, 42% of injuries due to UXO in children (aged 0–17 years) were when the victim was playing or tampering with explosives or herding animals.¹⁹ In a study in Eritrea, 41% of injuries were to the upper body in 248 victims aged 15 and below and 51% experienced an amputation.²⁰ Nevertheless, 69.9% of cases were 15 years and younger in our study, reminding that children living in the border regions of Iran and Iraq are opposed to great risks. In a study conducted in Jammu and Kashmir north of Pakistan, lower limb amputation was performed in 24 cases out of 28 landmine injuries in victims aged 13–55 years. The delay in providing emergency medical care leads to organ loss within first few hours of the blast.²¹ Only lower limb amputation rate was lower in our study with 8.7%.

Landmines and UXO are responsible for various degrees of ocular trauma including blindness. Due to the high energy blast, high-speeded plastic and synthetic parts of the mine and surrounding sand, dust and mud can cause ocular trauma.^{22–24}

We have determined ocular trauma with several foreign bodies in the cornea and sclera of the patients. Landmines are also an important cause of bilateral blindness.²⁵ One case resulted with bilateral blindness in our study and 21.7% had an ocular trauma.

5. Conclusion and perspectives

This study demonstrates that most of the landmine and UXO injuries are resulting in upper extremity amputations in children. Color and shape of explosives seem to encourage tampering in children. Strategies should be established to prevent and reduce landmine and UXO injuries in children through mine awareness programs directed for civilians and especially for children who live in high-risk areas. Identification and marking of dangerous areas understandable to cultural features and substantial mine clearance attempts are needed. Health infrastructures should be augmented by building a Rehabilitation Centre here in the region of Van with trained personnel for emergency care and transfer of the victims. In addition, the limited capacity for psychological support should be increased and social support should be established for children in this remote region.

Conflict of Interest

We declare that none actual or potential conflict of interest exists including any financial, personal or other relationships with other people or organizations within 3 years of beginning the submitted work that could inappropriately influence, or be perceived to influence, our work. This article has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis), it is not under consideration for publication elsewhere, its publication is approved by all authors and

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Funding

None declared.

Ethical Approval

None declared.

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